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TITLE: X-RAY SCATTER REMOVAL FOR ARTIFACT FREE CT IMAGING

ABSTRACTS

In the past decades, industrial computed tomography (CT) has become a powerful tool for the nondestructive, three-dimensional (3D) examination of intricate parts and their inner structures. In particular the possibility to inspect parts for inner defects allows a much better understanding of manufacturing processes and thus paves the way for systematic tuning of process parameters, for example in the field of additive manufacturing of aerospace components. However, the necessary x-ray energies to allow inspection of high density materials required in these applications come with the drawback that the interaction probability of scattering processes become more likely, which poses a limit to the resulting 3D image quality. Scattered radiation leads to a non-linear image formation resulting in image artifacts like streaking or cupping. In the worst case, these artifacts may limit defect recognition possibilities due to a mix of the actual defect signal and scattered radiation or it may inhibit further evaluation of the measured data as the resulting 3D image quality is not sufficient for, e.g., a high quality surface determination.

In this paper we present a method to compensate for scattered radiation artifacts. Using a newly developed workflow to determine the scattered radiation, scatter artifacts can be dramatically reduced to a level, where further evaluation of the data becomes possible with state-of-the-art algorithms. The method intrinsically corrects for all kinds of scatter problems that may occur in a CT system including scattering inside the object. We will demonstrate the approach for the inspection of turbine blades and large aluminum castings. We will show that using this method an image quality can be achieved, which is otherwise only available using fan-beam tomography with line detectors. In comparison to line detector based fan-beam CT we show the great potential of time reduction to allow high quality scans in minutes instead of hours.

KEYWORDS

X-Ray | Computed Tomography | Artifact Correction | Scatter Removal |